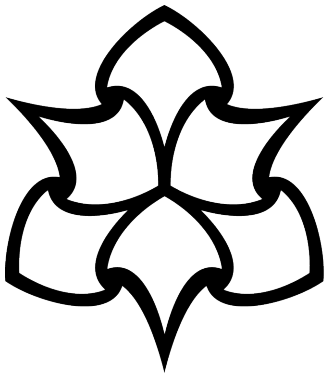

University Teaching Staff and Sustainable Development:

an assessment of competences

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Walter Leal Filho[a,b], Vanessa Levesque[c], Amanda Lange Salvia[a,d,*], Arminda Paço[e], Barbara Fritzen[f], Fernanda Frankenberger[g], Luana Damke[h], Luciana Brandli[i], Lucas Veiga Ávila[j], Mark Mifsud[k], Markus Will[l], Paul Pace[m], Ulisses Azeiteiro[n], Violeta Orlovic Lovren[o]

a) European School of Sustainability Science and Research, Hamburg University of Applied Sciences, Ulmenliet 20, D-21033 Hamburg, Germany
b) Department of Natural Sciences, Manchester Metropolitan University, Chester Street, Manchester, M1 5GD UK E-mail: w.leal@mmu.ac.uk
c) Department of Environmental Science and Policy, University of Southern Maine, 106 Bailey Hall, Gorham, ME, US. Email: vanessa.r.levesque@maine.edu
d) Graduate Program in Civil and Environmental Engineering, University of Passo Fundo, Campus I - BR 285, São José, 99052-900, Passo Fundo, RS, Brazil. +55 54 3316-8203. Email: amandasalvia@gmail.com
e) Universidade da Beira Interior, NECE-UBI (Research Centre for Business Sciences), Rua Marquês D'Ávila e Bolama 6201-001 Covilhã. E-mail: apaco@ubi.pt
f) Graduate Program in Civil and Environmental Engineering, University of Passo Fundo, Campus I - BR 285, São José, 99052-900, Passo Fundo, RS, Brazil. Email: barbara.m.fritzen@gmail.com
g) Business School PUCPR, Pontifical Catholic University of Paraná, 1155 Curitiba, and Brazil Business School, Positivo University, 5300 Curitiba, Brazil. E-mail: ferfrank1@hotmail.com
h) Federal University of Santa Maria, Av. Roraima, 1000 - Camobi, Santa Maria - RS, 97105-900, Brazil. E-mail: luanadamke@hotmail.com
i) Graduate Program in Civil and Environmental Engineering, University of Passo Fundo, Campus I - BR 285, São José, 99052-900, Passo Fundo, RS, Brazil. Email: brandli@upf.br
j) Federal University of Santa Maria - UFSM, Department of Postgraduate Studies in Administration, Cachoeira do Sul, RS, Brazil. Email: admlucasveiga@gmail.com
k) Centre for Environmental Education & Research, University of Malta, Msida MSD 2080, Malta. E-mail: mark.c.mifsud@um.edu.mt
l) University of Applied Sciences Zittau/Görlitz, Theodor-Körner-Allee 16, 02763 Zittau. E-Mail: m.will@hszg.de
m) Centre for Environmental Education & Research, University of Malta, Msida MSD 2080, Malta. E-mail: paul.j.pace@um.edu.mt
n) Department of Biology & CESAM Centre for Environmental and Marine Studies, University of Aveiro, 3810-193 Aveiro, Portugal. E-mail: ulisses@ua.pt
o) Faculty of Philosophy, University of Belgrade, Belgrade, Serbia. E-mail: violeta.orlovic@f.bg.ac.rs

*Corresponding Author

University Teaching Staff and Sustainable Development: an assessment of competences

Abstract

Teaching about matters related to sustainable development requires not only a personal motivation from educators, but also a variety of competences. This paper reports on a multi-country study, which aimed at identifying the level of importance given to desired competences on sustainable development by teaching staff at a number of higher education institutions. On the basis of the findings, the paper identifies the gaps and outlines some of the needs which should be addressed, via which competence building may help to foster the educational and societal transformation towards sustainability. The implications of this paper are two-fold. Firstly, it emphasises the value of and the need for competences on sustainable development. Secondly, it illustrates some of the needs which should be met in order to provide a framework among which competences on sustainable development may be further developed.

Keywords

Competences; University; Teaching staff; Sustainable development; Higher Education.

1. Introduction: Teaching Sustainable Development at Universities

Universities have been assuming the traditional role of being leaders and mentors in

society (White 2015), adapting themselves to new contexts and needs. Built on the ultimate aim to 'transform our World' (UN 2015), the UN document Agenda 2030 clearly reconfirms "ambition to strive for holistic, integrated, interdisciplinary education" (Lovren 2017), calling for all education institutions, and in particular universities, to contribute to this complex transformative process. A difficult mission has been assigned to Higher Education Institutions (HEIs) to prepare employable professionals for the knowledge based economy and, at the same time, to educate reflective citizens, who would contribute towards ending poverty, injustice and environmental and climatic degradation in the world. As such, there has been a renewed focus on identifying needed competences, especially those related to teaching and education outcomes (Rieckmann and Gardiner 2015; Levesque and Blackstone 2020). Meeting these highly demanding tasks requires reorientation of existing structures within the university, as well as a redefinition of the role of students, teachers, and researchers (Steiner and Posch 2006). Further, universities need to develop sustainability-concerned citizens, not only through specific disciplines, but also in a general context approach, fostering learners to have impact in their personal and professional lives (Leal Filho et al. 2019a; Ruiz-Mallén and Heras 2020).

Bearing in mind the multidimensional process of education, teaching staff should not only support students in the "acquisition of competences that enable people to live and act in a sustainable way" (Dannenberg and Grapentin 2016, p. 8), but also develop their own sustainability competences. It is of special importance to support teaching staff in building Education for Sustainable Development (ESD) competences, which are described as a "teacher's capacity to help people develop sustainability competencies through a range of

innovative teaching and learning practices" (Rieckmann 2018, p.56). By 'teaching staff' we are referring to the educators of varying ranks that teach at Higher Education Institutions. It is essential to prepare teaching staff to contribute to ESD (Taimur 2020; Albareda-Tiana 2019). Sustainable development (SD) and sustainability are two terms that can be approached differently (Axelsson et al. 2011) but both refer to management and governance mechanisms and the principles and processes for present and future generations to meet their needs (Olawumi and Chan 2018; WCED 1987). The terms are usually used interchangeably (Norton 2005), also as presented in the context of ESD competences (Rieckmann 2018). The spectrum of sustainable development competences is quite wide. It entails not only professional development in education and teaching, but also in respect of managing of institutions, curriculum development and monitoring and assessment of learning success.

While the implementation of the Sustainable Development Goals (SDGs) might be seen as another highly demanding policy request of universities, it can also be taken as a good opportunity for advancing the process of integration of SD into teaching and learning (Leal Filho et al. 2019a). There are recently developed guidelines for teaching staff to support in formulating and achieving learning objectives and outcomes related to all the SDGs and its targets, made under the framework of competences for sustainability and with the aim to provide recommendations for integrating ESD into teaching and learning at all the levels of education (UNESCO 2017). Creating an "enabling climate for teachers to participate in transformation of their teaching strategies within the 'whole institution' reforms, supported by the policy at the global, national and local level" (Lovren 2019, p.2) would offer a suitable environment for teaching staff to advance students' sustainability competencies as well.

However, there are multiple barriers to the level of systemic change at Higher Education Institutions needed for this type of transformation of sustainability teaching practices (Blanco-Portela et al. 2017), including critical thinking as a contribution to accelerating implementation of SDGs (Leal Filho et al. 2019a),

This paper describes a multi-country study that explores the level of importance given to desired competences on sustainable development by teaching staff at a number of higher education institutions. More specifically, we ask, "How does teaching staff see and perceive their competences in sustainable development education?". Consistent with this objective, an overview of the literature about competences in SD teaching will be presented, followed by the methods used in the study which collected data across a number of countries. Finally, the results of the quantitative research will be reported, analysed and discussed. On the basis of the findings, some conclusions are drawn.

2. Competences in Sustainable Development Teaching

Competence-based higher education enables students to acquire the important knowledge, skills, values, and attitudes that will be needed in their future professional and personal lives (Lambrechts et al. 2013). Rychen (2002) states that the use of competences contributes to improving students' assessment of the skills they acquire in addressing life's challenges, but also in setting important educational goals that improve lifelong learning systems and processes. Nevertheless, "competences are not based on any specific knowledge content, but rather more oriented toward questions of how the acquisition of the required competences can be made possible" (Holfelder 2019, p. 945). UNESCO (2017) proposed that ESD can contribute to achieving the SDGs and provided guidance on using it to support

progress on Global Goals, developing cross-cutting sustainability competences to deal with sustainability challenges in each goal and integrate them.

There are many propositions about the key competences for sustainability as shown by Barth et al. (2007), Wals (2010), Wiek et al. (2011), Rieckmann (2012), Wals (2014), Gombert-Courvoisier et al. (2014) and Lozano et al. (2017). While there are some similarities in the competences suggested by these and other authors, the literature related to competences for sustainability is still dominated by "laundry lists" rather than conceptually embedded sets of interlinked ones (Wiek et al. 2011). Table 1 presents a compilation of the most commonly discussed sustainability competences, based on the literature.

Table 1: Compilation of competences in sustainability from selected peer-reviewed literature

Authors	Sustainability Competences
Barth et al. (2007)	Seek interconnections, independence and partnerships; understanding cross-cultural cooperation for more flexible views; participation and capacity.
Wals (2011)	Think prospectively and to deal with uncertainty; work in an interdisciplinary manner; achieve open-minded perception; cross-cultural understanding and cooperation; participatory competency; planning and implementation competency; the ability to feel empathy; motivate oneself and others; reflect at a distance on individual and cultural concepts; and sympathy and solidarity.
Wiek et al. (2011)	Systems thinking, Strategic, Anticipatory, Normative and Interpersonal competence (across-cutting key competence in sustainability)
Rieckmann (2012)	Anticipatory thinking; interdisciplinary work; systemic thinking and handling of complexity; cooperation in (heterogeneous) groups; participation; planning and realizing innovative projects; empathy and change of perspective; ambiguity and frustration tolerance; critical thinking; acting fairly and ecologically; communication and use of media; and evaluation.
Wals (2014)	Competences to work in an interdisciplinary environment; acquire interconnections, interdependence and partnerships; flexible visions, cross-cultural understanding and cooperation; participatory competence; competence/capacity for planning and implementation; ability of empathy, sympathy and solidarity; personal motivation and among others; and understanding competence of distinct behaviour and cultural vision.

Gombert- Courvoisier et al. (2014)	Planning and implementation capacity; empathy, be nice and have solidarity; personal and group motivation; and understanding of distinct behaviour and cultural insight.
Lozano et al. (2017)	Systems thinking; interdisciplinary work; anticipatory thinking; justice, responsibility, and ethics, critical thinking and analysis; interpersonal relations and collaboration; empathy and change of perspective; strategic action, personal involvement; tolerance for ambiguity and uncertainty.
UNESCO (2017)	Systems thinking; anticipatory thinking; normative and strategic thinking; collaboration; critical thinking; self-awareness; integrated problem-solving.
Brundiers et al. (2020)	A combination of integrated problem-solving, interpersonal, implementation, strategic-thinking, values-thinking, futures-thinking, and systems-thinking competencies.

Developing these competences among graduates is critical to the development of sustainability literacy (Cebrián and Junyent 2015), and can help students become positive agents for personal change and more effective professionals (Sipos et al. 2008). Some universities have created specific systems that address the suggestions made by international bodies (UNESCO 2015), discussing in depth competences for sustainable development in courses, professional development programs, community outreach activities and continuing education for all change agents, even for those who intend to pursue careers outside the university structure (Wals, 2014). However, the education for sustainable development (ESD) literature on sustainability competences has mostly focused on enabling learners to respond to local and global challenges. While there is a paucity of work that focuses on educators' competences to be able to teach and practice sustainability (Rauch and Steiner 2013), the last few years has seen growing attention to this topic (Uitto and Saloranta 2017; Vare et al. 2019, Roy et al. 2020).

Having the competencies to teach sustainable development requires teaching staff to go beyond being instructors of specific content, to becoming dynamic members of the

classroom in which they engage in dialogue with students, their parents and the community (Sleurs 2008). For example, community-based learning can provide key learning experiences to students, and thus could be one of many specific pedagogical approaches for teaching staff to master (Deri 2001). Teaching staff must be able to encourage visioning of new solutions to current challenges, practice systems-thinking, engage students in directing their own learning, and prepare students to network with partners in and out of school (Roy et al. 2019; Sleurs 2008). To do this, teaching staff must themselves understand the complexities of sustainability, mediate the conflicting values and perspectives inherent in sustainability, create and critique differing transformative visions for society, and engage cooperatively with community actors (Rauch and Steiner 2013; Sleurs 2008). Bertschy et al. (2013) compare two models of teacher education competence development in ESD and find that both models highlight the demanding task of preparing teaching staff for this responsibility, and that doing so goes beyond typical didactic teacher training. In fact, competences for ESD cannot be simply communicated or taught, but must be learned through practice (Vare at al. 2019).

For teaching staff to enable students to achieve these competencies, Cebrián and Junyent (2014) developed a theoretical framework of professional ESD competencies and elaborated seven main components, as shown in Table 2. Teaching staff need to develop these competencies in their professional practice, in order to duly incorporate a sustainability dimension into the teaching-learning process.

Table 2 – Professional Competences in ESD

Categories	Description
Future/alternative scenarios visioning	Understanding the different scenarios, possible futures, promoting work with different visions and scenarios for alternative and future changes.
Contextualizing	Taking into account the different dimensions of a problem or action, the spatial dimension (local-global) and the temporal dimension (past, present and future).
Work and live with complexity	The ability to identify and connect the ecological, economic and social dimensions of problems. Generate the conditions for systems thinking in the school environment.
Think critically	Creating the conditions for critical thinking to question assumptions and to recognize and respect different trends and views in different situations.
Decision-making, participation and acting for change	Moving from awareness to action; sharing responsibilities and engaging in joint action.
Clarify values	Values clarification and strengthening behaviour towards sustainability thinking, mutual respect and understanding of other values.
Establish a dialogue between disciplines	Developing teaching and learning approaches based on innovation and interdisciplinarity.
Manage emotions and concerns	Promoting reflection on one's own emotions and as a means to reach a deeper understanding of problems and situations.

Source: Cebrián and Junyent (2014).

In the view of Cebrián and Junyent (2014), professionals should be able to envision future scenarios, understand the context and the complexity of problems, think critically, clarify values, work interdisciplinarily and manage emotions. To do so, teaching staff need to have sustainability competences themselves and be able to develop them within their

learners (Vare et al. 2019). Table 3, based on experiences from the European School of Sustainability Science and Research (ESSSR) and the Inter-University Sustainable Development Research Programme (IUSDRP) which run a wide training programme on matters related to sustainable development, lays out a synthesis of the competences needed by sustainability teaching staff as discussed in the literature.

Table 3: Competences required of sustainability teaching staff

Competence	Usefulness
Knowledge of the subject matter	Allows a proper handling of sustainability issues in teaching programmes
Interdisciplinary thinking	Caters for due consideration to inputs from various areas and disciplines
Analytical capacity	Ability to understand connections between topics and contexts
Capacity to implement solutions	Support the problem-solving process
Ability to value varying perspectives	Shapes personal and collective identities and the formation of responsible citizenship
Commitment to SD	Demonstrates "doing by example" in respect to conservation of the environment, social responsibility, ethics and cultural diversity

Source: the authors

Further, the United Nations Economic Commission for Europe (UNECE 2015), has proposed that the competences for ESD should involve three foundations: professional development in education; government and administration institutions curriculum development; and monitoring and evaluation. To enable teaching staff to do this, the following methods should be applied to their training: learn to know; learn to live together; learn to do; and learn to be.

Vare et al. (2019) built on the UNECE (2015) and UNESCO (2017) frameworks for teaching competencies for SDGs to create a more manageable and practical set of competences for ESD called a Rounder Sense of Purpose (RSP). Using the same three main categories from UNECE: holistic approach, envisioning change, and achieving transformation, the RSP identifies 12 competences for ESD (Figure 1).

(Figure 1 here)

This literature review on competences in Education for Sustainable Development reflects the growing interest in developing a converging set of key competences that can guide teaching staff. Yet, this literature review also attests to the complexity of defining such competencies. Attempts at creating a definitive list have proved to be very difficult (if not impossible) to achieve, primarily because of different ideologies, perspectives, contexts and priorities. Further, there appears to be no effort to date to assess the degree to which teaching staff value these ESD competences. It is unknown if teaching staff responsible for ESD are prepared for this task, or if there are some areas in which they are less capable than others. We address this gap in the literature by asking how teaching staff see and perceive the competences in sustainable development education.

3. Methods

Based on the diversity of views and perspective on competences, and the need to shed some light on the ways they are perceived and practised, an international survey was designed, in order to assess the extent to which teaching staff value competences in education for sustainable development. It was partly based on the UNECE's list of Competences in

Education for Sustainable Development (UNECE 2012). As per this document, the set of competences listed represents a goal for all educators. Combined, they may work as a framework for professional development. A summary of this framework of competences is presented in Figure 2.

(Figure 2 here)

This model was chosen as a departure point, however the individual items making up the instrument reflected other elaborations of the model, such as the RSP palette proposed by Vare et al. (2019). However, in contrast to what Bertschy et al. (2013) suggest, the research instrument featured items focusing on personal behavior and lifestyle towards sustainability as the research team considered these as crucial elements at the heart of the hidden curriculum within each educational institution.

The survey had five sections: one for each group of competences and one for collecting demographic details about the respondents (country, how many years of teaching and areas taught). The four main sections had in total 52 statements to which the respondents used Likert Scale to indicate their levels of agreement and importance. The end of the questionnaire provided an open space for respondents to add comments or suggestions, if desired. Apart from the details from each person, the instrument asked about the areas they teach, and list various competences teaching staff should have.

The instrument was pre-tested by five sustainability specialists with expertise and numerous publications in the area of sustainability in higher education. The main comments were connected to style and wording and these were useful to adjust the survey accordingly. After this pre-test, the survey was sent out to members of the Inter-University Sustainable

Development Research Programme (IUSDRP) which includes more than 150 participating universities in different countries and represents a network of universities which have been collaborating together on sustainable development research. This group has been participating in various studies related to sustainability in higher education (Leal Filho et al. 2019b; 2019c). The online survey was sent out using the Google Forms tool and the invitation to participate in the study clearly stated it was directed to teaching staff working at higher education institutions. Additionally, the first questions were related to years of experience in teaching and main areas taught, which would prevent students and staff from responding.

The survey remained active for two months (October and November/2019) and in addition to the first invitation, three reminders were sent out during this period. In total, 120 respondents completed the survey. The countries of origin of these participants are presented in Figure 3 and include: USA (n=23), Brazil (n=18), UK (n=9), Portugal (n=8), Germany (n=7), Australia (n=5), Serbia (n=4), Spain (n=4), Belarus, Chile, China, Colombia, Ghana, Guatemala, India, Italy, Malaysia, Sweden, Zimbabwe (each with n=2), Bangladesh, Canada, Croatia, Greece, Hungary, Iran, Israel, Jamaica, Japan, Kenya, Liberia, Malta, Nigeria, North Macedonia, Norway, Qatar Sri Lanka, The Netherlands, Switzerland and Uganda (each with n=1). The number of responses can be considered a limitation of this study; for this reason, future studies may replicate this research to not only compare the results, but also investigate a larger sample.

(Figure 3 here)

Figure 4 presents a summary of the years of experience in teaching and areas taught for the sample. Most of the respondents have been teaching for more than 10 years (68.3%) and the main two areas are Social Science and Business.

(Figure 4 here)

The results, outlined in the next section, are presented using descriptive statistical analysis, based on mean and standard deviation tests with support of the software SPSS. For the mean, Likert Scale results were scored from 1 to 5 (e.g. Very low importance = 1; Low importance = 2; Medium Importance = 3; High importance = 4; Very high importance = 5). The results also report the percentage of respondents who selected each response in the Likert Scale. For a full view of the nature of data collected, the instrument used is placed as an Appendix.

4. Results and discussion

The first group of results relate to the category of 'Learning to know' in which educators report on their competence regarding the degree to which they understand sustainability knowledge (Table 4) and value related teaching practices (Table 5). Overall, teaching staff report high general sustainability knowledge, especially in relation to: the interrelationships between organisms and physical environment (1), the connection between social and environmental issues (2), the cause-effect relationship between consumption and poverty (4), the need for political will and investment to achieve SD (7), and the change of unsustainable practices aiming at a better future (9). Similarly, teaching faculty found related teaching practices to have high or very high importance, with the highest percentage of

respondents valuing student encouragement (15) and application of concepts to real world problems (20).

Table 4. Level of agreement with statements about 'Learning to know – sustainability knowledge'

Variable	Percentage of respondents					Mean	Standard Deviation
	Strongly disagree	Disagree	Don't know	Agree	Strongly agree		
1. Ecological systems are a set of interrelationships between various organisms and their physical environment.	4.2	2.5	1.7	29.2	62.5	4.43	.967
2. Issues of poverty, hunger and social inclusion should be addressed separately from environmental protection studies.	59.2	28.3	2.5	5.8	4.2	1.67	1.06
3. Limits on growth must be imposed, because the resources on our planet are finite.	0.0	15.0	2.5	42.5	40.0	4.07	1.01
4. Excessive consumption in one part of the world is causing poverty in another.	1.7	7.5	12.5	29.2	49.2	4.16	1.02
5. Development decisions should be based on scientific evidence rather than cultural concerns.	5.0	32.5	20.0	33.3	9.2	3.09	1.10
6. Sustainable development is an evolving concept.	3.3	4.2	3.3	39.2	50.0	4.28	.963
7. Achieving sustainable development requires political will and investment.	3.3	0.8	1.7	17.5	76.7	4.63	.894
8. Citizens have no power if governments do not promote sustainable practices.	13.3	44.2	11.7	17.5	13.3	2.73	1.27
9. Changing unsustainable practices today ensures a better quality of life for the future.	4.2	2.5	4.2	25.0	64.2	4.42	.992
10. Science and technology provide all the solutions needed to solve problems caused by unsustainable development.	33.3	40.0	5.0	13.3	8.3	2.23	1.27
11. Social sustainability is achieved by overcoming differences of race, gender, class, generation, skills and beliefs.	8.3	11.7	22.5	34.2	23.3	3.52	1.21

Table 5. Level of importance given to 'Learning to know – teaching practices'

Variable	Percentage of respondents					Mean	Standard Deviation
	Very low importance	Low importance	Medium importance	High importance	Very high importance		
12. Learning about your students' interests	0.0	3.3	26.7	39.3	30.8	3.97	.844

13. Encouraging your students to question what they are being taught.	0.0	1.7	11.7	39.2	47.5	4.32	.746
14. Promoting problem solving.	0.8	0.0	4.2	40.8	54.20	4.47	.660
15. Encouraging students to be creative and seek new ways to resolve issues.	0.0	0.0	6.7	35.0	58.3	4.51	.621
16. Structuring your teaching around your students' experiences.	0.8	1.7	30.0	39.2	28.3	3.92	.851
17. Changing educational structures to promote more learner autonomy.	0.0	2.5	21.7	41.7	34.2	4.07	.811
18. Trying new learner-centred pedagogies that enhance learning (e.g. project based learning)	0.8	1.7	14.2	38.3	45.0	4.25	.822
19. Prepare students to meet new challenges in the unforeseen future	0.0	0.0	10.0	44.2	45.8	4.35	.658
20. Applying concepts to real world problems	0.0	0.0	1.7	25.8	72.5	4.70	.491
21. Engagement in place-based learning	0.0	2.5	25.8	30.8	40.8	4.10	.873
22. Giving equal learning opportunities for people with disabilities	1.7	1.7	15.0	29.2	52.5	4.29	.901

These first sets of results suggest that survey respondents were themselves familiar with sustainability concepts and teaching practices that are discussed in the literature on ESD competences. Our results suggest that teaching faculty do acknowledge the relevance of competences for ESD for them as teachers. This finding is consistent with other previous studies have identified, such as Rychen (2002) and Lambrechts et al. (2013), as ESD competences acquired will help them to promote a problem solving approach (items 14 and 15), by applying concepts to the real-world problems.

The second set of results is related to the category of 'Learning to do' in which the educator is able to do things such as create participatory and learner-centered learning opportunities (Table 6). Survey respondents felt that it was very important to do all of the identified teaching practice (all statements had Likert means higher than 4.20), and the statement with the highest score (4.54 Likert mean) was the use of real-world events as a

source of learning (29). Again, these results imply that the teaching staff that responded to our survey are familiar with the value of pedagogical approaches identified in the literature as important for ESD. Others have found that, in practice, these learner-centered pedagogical approaches are essential for development of student sustainability competence (Roy et al. 2019).

Table 6. Level of importance given to 'Learning to do'

Variable	Percentage of respondents					Mean	Standard Deviation
	Very low importance	Low importance	Average importance	High importance	Very high importance		
23. Communicating a sense of urgency to take action for a sustainable future	0.0	5.8	9.2	39.2	45.8	4.25	,852
24. Evaluating the potential consequences of decisions and actions	0.8	3.3	6.7	45.0	44.2	4.28	,801
25. Fighting prejudice and preconceptions.	0.0	5.0	14.2	28.3	52.5	4.28	,890
26. Exploring issues from different (e.g. cultural, religious, social) perspectives	0.0	4.2	15.0	34.2	46.7	4.23	,857
27. Inspiring hope when faced with the problems caused by unsustainable practices	0.0	0.8	17.5	39.2	42.5	4.23	,764
28. Becoming a change agent in your community	0.0	0.0	15.8	36.7	47.5	4.31	,733
29. Using real-world events as a context and source of learning	0.0	0.8	4.2	35.0	60.0	4.54	,620
30. Framing local issues with global concerns	0.0	0.8	10.0	40.8	48.3	4.36	,697
31. Anticipating and responding to change	0.0	3.3	8.3	48.3	40.0	4.25	,747
32. Learning from past experiences	0.8	1.7	9.2	37.5	50.8	4.35	,786

The third set of results is related to the category of 'Learning to live together' in which the educator is able to work with others and develop partnerships in ways that engage different stakeholder groups (Table 7). These statements had lower Likert means compared to the other categories of questions. The statement with highest mean (4.21) was the promotion of

dialogues about different worldviews in the classroom (37). These results suggest that while teaching staff still see the importance of these concepts, they are relatively less valued than the other competences queried in the survey. And yet active collaboration with stakeholders is a well-established tenant of addressing sustainability challenges; faculty must have the competence to prepare their students in this realm (Yarime et al. 2012).

Table 7. Level of importance given to 'Learning to live together'

Variable	Percentage of respondents					Mean	Standard Deviation
	Very low importance	Low importance	Medium importance	High importance	Very High importance		
33. Collaboration with other people within your own department/faculty.	2.5	5.0	14.2	39.2	39.2	4.11	.861
34. Collaboration with other people from different departments/faculties within your institution.	0.0	4.2	19.2	34.2	42.5	4.07	.980
35. Collaboration with other people from different institutions.	0.0	4.2	19.2	34.2	42.5	4.07	.981
36. Challenging unsustainable practices at your educational institution.	2.5	4.2	19.2	36.2	37.9	4.18	.809
37. Promoting dialogues about different worldviews in the classroom.	0.0	1.7	13.3	46.7	38.3	4.21	.735
38. Encouraging student acceptance of multiple ways of knowing.	8.0	6.7	20.8	35.8	35.8	3.99	.957
39. Facilitating student consultation and engagement with the various stakeholders involved in an issue.	1.7	6.7	23.3	27.5	40.8	3.99	1.03
40.Promoting student engagement (e.g. project activities) with different groups (e.g. ages, ethnicity, cultures, beliefs).	0.8	1.7	13.3	45.8	38.3	4.19	.791

The fourth and final set of results is related to the category of 'Learning to be' in which the educator, themself, is inclusive of different perspectives, motivated to make a positive contribution and inspires creative innovation (Table 8). Again, the survey respondents found all the educator characteristics to be important, with only slight differences in the average Likert scores among various statements. These results imply that teaching staff

who responded to this survey were personally committed to the development of their own inclusivity, engagement, motivation and critical learning, among other qualities.

Table 8. Level of importance given to 'Learning to be'

Variable	Percentage of respondents					Mean	Standard Deviation
	Very low importance	Low importance	Medium importance	High importance	Very high importance		
41. Being inclusive of different disciplines, cultures and perspectives.	8.0	1.7	13.3	45.8	38.3	4,19	,791
42. Inspiring creativity and innovation.	0.0	8.0	6.7	41.7	50.8	4,42	,656
43. Being a critically reflective practitioner.	0.0	1.7	5.0	33.3	60.0	4,51	,673
44. Engaging with learners in ways that build positive relationships	1.7	0.0	12.5	39.2	46.7	4,29	,813
45. Accepting indigenous knowledge as a valid contribution to decision-making.	1.7	5.8	21.7	35.0	35.8	3,97	,982
46. Feeling motivated to take action to improve the quality of life of other people locally.	0.0	2.5	15.8	40.8	40.8	4,20	,794
47. Feeling motivated to take action to improve the quality of life of other people globally.	0.0	1.7	20.0	41.7	36.7	4,13	,787
48. Challenging assumptions underlying unsustainable practice.	0.0	0.0	10.8	42.5	46.7	4,35	,671
49. Seeking opportunities for self-directed learning.	0.0	2.5	17.5	37.5	42.5	4,20	,815
50. Questioning (including personal) beliefs and assumptions.	0.0	3.3	13.3	40.0	43.3	4,23	,806
51. Being sensitive to the feelings and emotions of people during decision making.	0.0	1.7	16.7	41.7	40.0	4,20	,773
52. Fostering partnerships (internal-external)	2.5	1.7	11.7	37.5	46.7	4,24	,907

Comments from the open space offered in the survey provided additional insight into respondents' experiences of teaching sustainable development. The use of practical activities seems to be a positive approach (including guest lecturers and study visits) but support of partnerships was stated as necessary for successful implementation of SD teaching (especially in the context of vulnerable populations and engagement in programs organised by developed countries). Challenges included keeping students interested and motivated; the

desire to be a creative professor while having a comprehensive, mandatory curriculum; little institutional support for changing practices (e.g. provision of training, rewards for engagement on competence building or advice on how to achieve transformation); and the economic crisis.

Throughout the survey, the majority of teaching staff identify all items as either high importance or very high importance. For this reason, the analysis below first concentrates on those answers with a lower standard deviation from the Likert mean, and then focuses on the responses that had a higher standard deviation from the Likert mean.

The variables with the lowest standard deviation from the Likert mean indicate statements with the highest level of agreement among all respondents. In our study, teaching staff seem to have the highest agreement with some of the competences proposed by Cebrián and Junyent (2014). For example, these results highlight the importance teaching staff give to 'future/alternative scenarios visioning' and 'contextualizing', as seen in their agreement with competences to apply concepts to the real-world problems (Table 5 [to know], item 20), use real-world events as a context and source of learning (Table 6 [to do] - item 29), promote dialogues about different world views in the classroom (Table 7 [to live together] - item 37), and frame local issues with global concerns (Table 7 [to do] - item 30). The category 'think critically' from Cebrián and Junyent (2014) is also confirmed, as teaching staff encourage students to be creative and seek new ways to resolve issues (Table 5 [to know] - item 15), encourage students to be a critically reflective practitioner (Table 8 [to be] - item 43), and inspire creativity and innovation (Table 8 [to be] - item 42).

Other survey statements had higher standard deviations, indicating that teaching staff responded with a greater spread along the Likert scale. Questions 34 and 35 (Table 7

[learning to live together]) and 52 (Table 8 [learning to be]) had the highest standard deviations. Rieckmann (2012) describes these ideas as a competence in 'cooperation in (heterogeneous) groups', and the present research indicates inconsistent agreement with importance of developing this ability among teaching staff. A further example is question 45 (Table 8 [accepting indigenous knowledge as a valid contribution to decision-making]). To Wals (2014), one of the sustainable competences is 'understanding competence of distinct behaviour and cultural vision', but not as many teaching staff respondents agreed that this competence is important to their teaching.

While we cannot comment on how educators acquired their knowledge and attitudes or the degree to which they have mastered them, we can surmise that they are largely self-taught given that most respondents are teaching from longer periods of time; in other words, it is unlikely they received formal training in sustainability or sustainability education, unless the HEI where they teach provided this opportunity. This is supported by Vare et al (2019) who suggest that educators acquire and enhance ESD competences throughout one's career, and not during a brief process. These results also suggest that for those educators that are motivated, it is not necessary to have the institutional-level, full-system support for preparing educators as suggested in the literature (e.g. Lovren 2019; Bertschy et al. 2013; Wals 2010).

Our study also found that teaching faculty equally value knowledge and teaching practice competences; the 'Learning to Know' competences, for example, did not score any higher than the 'Learning to Do' competences. Again, this is in contrast to the literature that assumes there is a greater focus on the acquisition of sustainability knowledge compared to sustainability pedagogy (Vare et al. 2019). Teaching staff in the field of sustainability

recognized the value of teaching methods such as deliberative dialogue, problem-based learning, and community-based learning, among others.

5. Conclusions

The objective of this study was to identify the degree to which teaching staff value and perceive competences in education for sustainable development at higher education institutions around the world. Our literature review provided a robust description of the competences needed for teaching about sustainable development that center around learning to know, learning to do, learning to be and learning to live together in relation to knowledge of sustainability problems, interdisciplinary and analytical thinking, developing solutions, and recognizing diverse values.

Taken as a whole, our results suggest that survey respondents, who currently teach sustainability, are highly aware of and in agreement with the concepts behind the ESD competences groupings proposed by UNECE. Competences related to application of concepts to real-world problems scored especially high, suggesting that teaching staff recognize the value of using context-specific, engaged learning in ESD. Competences with relatively lower scores and greater standard deviations were related to fostering partnerships and engaging students with stakeholders. Given the stakeholder-based, solutions-oriented nature of addressing sustainability problems, this suggests a potential key gap to fill. Perhaps better institutional support for teaching staff to learn from and engage with local community issues would help establish more confidence and ability in this particular pedagogical approach.

We also suggest that because many of the teaching staff that responded to this survey have been teaching for over 10 years, that they may have acquired these competences over time, primarily through their own initiative. We acknowledge that this implies that some faculty may not require full institutional embrace of ESD in order to gain needed competences. However, these teaching staff may be considered to be 'early adopters' who could be instrumental in helping develop methods for training new teaching staff who are less motivated or experienced to build their ESD competences. These master teachers could be surveyed for a more detailed analysis of the ways in which they developed their knowledge and competences, challenges they have faced, and suggestions they have for training new educators. Further, these experienced ESD educators could be tapped for leading competence-based teacher training webinars, and for connecting one-on-one as peer mentors to new sustainable development teachers.

As this paper has outlined, 'Future or alternative scenarios visioning' or 'contextualizing' are among some of the most popular competences, as teaching staff apply concepts to real-world problems. The use of real-world events as a context and source of learning is also another means via which competence for ESD can be furthered. In respect of the opportunities in the process of teaching sustainable development, it can be seen that practical activities are regarded as positive procedures, and this may include not only guest lecturers and study visits but also hands-on experiments. The role of partnerships was also regarded as an important one in the successful implementation of SD teaching, although 'Learning to live together' competences were slightly undervalued compared to the other categories.

As far as challenges are concerned, keeping a sustained interest and motivation from

students interested against a background of curriculum obligations and limited institutional support are elements which may hinder the process. In order to address them and to move forward, it is suggested that conventional teaching on matters related to sustainable development be supported by more interactive elements such as:

a) Webinars on sustainability issues

b) Podcasts on the selected themes on campuses or outside them

c) Internet-based exercises students may perform and report on

Many other methods could be added to this list. Indeed, digital-based technologies may not only make the teaching more interesting to students, but may also foster other skills along the way, such as IT-skills, the ability to process varied sets of data, or caters for a view "out of the box" in which a national or even international dimension may be added to the advantage of an "active learning" process. In addition, a "project-based" approach to SD learning, which is known to be effective (e.g. Leal Filho et al. 2016), may be successfully deployed to the advantage of competence building.

This paper has some limitations. Firstly, the survey's focus on ESD competences is quite specific and respondents may be those with a greater pre-existing interest in this topic. We acknowledge that this likely influences our results related to the overall high experience of respondents with the competences. Secondly, respondents who teach in the Social Sciences and Business were overrepresented in our sample, while those from engineering and natural sciences are not well represented. Thus, we do not know for certain if our results hold across teaching staff from all types of disciplines; there may be some fields in which faculty are more likely to have mastered the ESD competences than others.

Despite the above limitations, the paper provides a timely and useful contribution to

the literature. It reports on an international study focusing on competences involving a set of 120 respondents from 40 countries and all five continents and appears to be the first study that assesses teaching faculty perceptions of competences for ESD. This study involved not only rich countries such as Germany, England, Italy, Norway, and the United States, but also developing countries such as Brazil, Bangladesh, Guatemala, and Zimbabwe, among others.

A final lesson from this study is that sustainability teaching competence building, while primarily done on an individual, 'ad hoc' basis, could be made stronger if prominently placed as one of the learning objectives in graduate courses and in degree programmes. Also, competence building can be strengthened if it is paralleled by capacity building at HEIs. Access to training and capacity building programmes may allow them to better address and respond to the challenges of teaching sustainable development. Additional studies could explore methodologies for establishing a more nuanced ESD competence rubric, although doing so across multiple disciplines and countries may not be reasonable, since sustainability education is context-specific.

Conflict of Interest

The authors declare that they have no conflict of interest.

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List of Figures

Figure 4. Sample details on teaching experience

APPENDIX A

Competences in Sustainable Development Teaching

A. Your Country:
B. Teaching for:
   ( ) less than 1 year ( ) between 1-5 years
   ( ) between 5-10 years ( ) more than 10 years
C. Area(s) you teach: (multiple answers possible)
   ( ) Social science ( ) Humanities
   ( ) Natural Sciences ( ) Engineering & Technology
   ( ) Business ( ) Health ( ) Other:

Learning to know

To what degree do you agree with the following statements:

	Strongly disagree	**Disagree**	**Don't know**	**Agree**	**Strongly agree**
1. Ecological systems are a set of interrelationships between various organisms and their physical environment.					
2. Issues of poverty, hunger and social inclusion should be addressed separately from environmental protection studies.					
3. Limits on growth must be imposed, because the resources on our planet are finite.					
4. Excessive consumption in one part of the world is causing poverty in another.					
5. Development decisions should be based on scientific evidence rather than cultural concerns.					
6. Sustainable development is an evolving concept.					
7. Achieving sustainable development requires political will and investment.					
8. Citizens have no power if governments do not promote sustainable practices.					
9. Changing unsustainable practices today ensures a better quality of life for the future.					
10. Science and technology provide all the solutions needed to solve problems caused by unsustainable development.					
11. Social sustainability is achieved by overcoming differences of race, gender, class, generation, skills and beliefs.					

In your teaching, how much importance do you give to:

	Very low importance	Low importance	Medium importance	High importance	Very high importance
12. Learning about your students' interests					
13. Encouraging your students to question what they are being taught.					
14. Promoting problem solving.					
15. Encouraging students to be creative and seek new ways to resolve issues.					
16. Structuring your teaching around your students' experiences.					
17. Changing educational structures to promote more learner autonomy.					
18. Trying new learner-centred pedagogies that enhance learning (e.g. project based learning)					
19. Prepare students to meet new challenges in the unforeseen future					
20. Applying concepts to real world problems					
21. Engagement in place-based learning					
22. Giving equal learning opportunities for people with disabilities					

Learning to do

In your teaching, how much importance do you give to:

	Very low importance	Low importance	Average importance	High importance	Very high importance
23. Communicating a sense of urgency to take action for a sustainable future					
24. Evaluating the potential consequences of decisions and actions					
25. Fighting prejudice and preconceptions.					
26. Exploring issues from different (e.g. cultural, religious, social) perspectives					
27. Inspiring hope when faced with the problems caused by unsustainable practices					
28. Becoming a change agent in your community					
29. Using real-world events as a context and source of learning					
30. Framing local issues with global concerns					
31. Anticipating and responding to change					
32. Learning from past experiences					

Learning to live together

In your teaching, how much importance do you give to:

	Very low importance	Low importance	Medium importance	High importance	Very High importance
33. Collaboration with other people within your own department/faculty.					
34. Collaboration with other people from different departments/faculties within your institution.					
35. Collaboration with other people from different institutions.					
36. Challenging unsustainable practices at your educational institution.					
37. Promoting dialogues about different worldviews in the classroom.					
38. Encouraging student acceptance of multiple ways of knowing.					

39. Facilitating student consultation and engagement with the various stakeholders involved in an issue.	
40.Promoting student engagement (e.g. project activities) with different groups (e.g. ages, ethnicity, cultures, beliefs).	

Learning to be

How much importance do you give to the items below, as part of your teaching practices:

	Very low importance	**Low importance**	**Medium importance**	**High importance**	**Very high importance**
41. Being inclusive of different disciplines, cultures and perspectives.					
42. Inspiring creativity and innovation.					
43. Being a critically reflective practitioner.					
44. Engaging with learners in ways that build positive relationships					
45. Accepting indigenous knowledge as a valid contribution to decision-making.					
46. Feeling motivated to take action to improve the quality of life of other people locally.					
47. Feeling motivated to take action to improve the quality of life of other people globally.					
48. Challenging assumptions underlying unsustainable practice.					
49. Seeking opportunities for self-directed learning.					
50. Questioning (including personal) beliefs and assumptions.					
51. Being sensitive to the feelings and emotions of people during decision making.					
52. Fostering partnerships (internal-external)					

Please let us know if you have any comment or wish to add/highlight anything:

_____